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ABSTRACT

Children's learning from television was studied in 343 fourth, sixth, seventh, and eighth grade students who viewed an edited version of a television program and took a posttest. It was hypothesized that children would learn more plot-relevant information (central learning material) as they moved from concrete operational to formal operational stages. The fourth grade students represented the concrete operational stage, while the eighth grade students represented the formal operational stage. Sixth and seventh grade students were used as a transitional group. When interest in the television program, subject sex, and perceptions of the program's reality were controlled, the sixth, seventh, and eighth grade students learned more central material than did the fourth grade students. Peripheral learning (plot-irrelevant information) also increased from fourth to seventh grades, but decreased from seventh to eighth grades. When sixth and seventh grade students were treated as a group, peripheral learning increased from fourth to sixth-seventh grades, then decreased from sixth-seventh to eighth grades. The findings on peripheral learning were significant only when the grade levels were not grouped. Student interest and subject sex were significant predictors of learning that seemed to mask developmental differences. The more interested students learned more than the less interested students, and boys learned more than girls. (RL)

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Testing Confounds to a Developmental Theory of Children's Learning from Television

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Children's learning from television has been the subject of considerable investigation by communication researchers. A great deal of time has been spent identifying knowledge, attitudes and behaviors learned from: (a) violent media portrayals (cf. Baker & Ball, 1969; Surgeon General's Report, 1972); (b) public affairs information (cf. Chaffee, Ward, & Tipton, 1970); (c) televised advertising (cf. Ward, Wackman, & Wartella, 1977); (d) educational television (cf. Ball & Bogatz, 1970, 1973); and (e) televised entertainment (cf. Gerbner, Gross, Eleey, Jackson- Beeck, Jeffries-Fox, & Signorielli, 1977; Miller & Reeves, 1976). The accumulated evidence supports the notion that children can and do learn from the mass media.

Researchers interested in this process report two types of material that children learn from television; central material and peripheral material (Collins, 1970; Hawkins, 1973). Central material refers to information that is central to the plot of a story. This is important information--essential to the narrative sense of the presentation. Peripheral material refers to that content which is not relevant to the plot of a story--unimportant information.

This Peripheral content often contains diverse information ranging from appropriate roles for men and women to the frequency and nature of violent and criminal behaviors. It is the peripheral information from television which may be responsible for television's negative impact.

Consequently, investigating those factors which influence children's learning of peripheral content merits our attention. When this content is distorted and sterotyped, an understanding of how this information is learned becomes even more important. Thus, a signigicant portion of media effects may be explained by an examination of how peripheral learning occurs.

Looking at the research conducted in the area of peripheral learning, previous investigators have reported two findings regarding the process of children's learning from the media (Collins, 1970; Hawkins, 1973). First, the learning of central material increases with age. Second, the learning of peripheral material increases up to early adolescence and then decreases as children get older. The explanation for this relationship between age and peripheral learning revolves around older adolescents' ability to better differentiate important and unimportant information. As a result of this ability, they selectively direct their attention to the important information and learn more central and less peripheral information than younger adolescents. Young children, not as adept at differentiating important from unimportant information, do not selectively direct attention.

There is, however, an issue associated with this explanation that needs to be examined. This issue concerns a number of third variables that may determine the relationship between television exposure and children's learning. There is some evidence that interest in the media presentation (Hawkins, 1973) and positive evaluations of the presentation (Collins, 1970) attenuate the relationship between age and peripheral learning. The developmental differences explanation is weakened to the extent that these third variables attenuate this relationship. However, the evidence regarding these variables is both weak and inconsistent. Theory and research in the area of children's cognitive development affords a sense of understanding and provides an explanation of children's learning plot-relevant and irrelevant information from television.

Cognitive Development

The most complete and best known theory of cognitive development is that of Piaget (Piaget & Inhelder, 1969). His explanation of intellectual development includes two important processes, organization and adaptation (Wackman & Wartella, 1977).

> Organization is the tendency of the child to systematize his psychological processes into coherent sets resulting in a relatively well coordinated and efficient system. Adaptation is composed of two complementary tendencies. Accommodation is the tendency to change structures to cope with environmental demands; assimilation is the tendency to incorporate events from the environment into his structures (Wackman & Wartella, 1977, p. 204-205).

Intellectual growth occurs as a result of the resolution of the tension between accommodation and assimilation. Flavell (1963) describes this cognitive growth as an organized process of accommodating the old to the new and assimilating the new to the old.

When the child organizes these cognitive structures a dynamic balance occurs between accommodation and assimilation. This state forms a stage of intellectual development. As the child continues to adapt, more and different structures are acquired. One stage is followed by another which encompasses even more structures that enable the child to function at a higher intellectual level. In addition to this adaptation process, Piaget acknowledges the role that other factors play in the cognitive development of the child. These include the physical maturation of the child and the experiences the child has with objects and other people. These factors tend to speed up or slow down a child's passage from one stage of development to another (Piaget & Inhelder, 1969).

Piaget has described four stages of cognitive development (Piaget & Inhelder, 1969). These include the sensory-motor stage (up to two years of age), the preoperational stage (from about two to about seven years of age), the concrete operational stage (from about seven to about twelve years of age), and the formal operational stage (from about twelve to fifteen years of age). Only these last two stages are important for this discussion.

In both the concrete operational and the formal operational stages, a number of conceptual and perceptual structures exist. Some of these cognitive structures can help explain children's learning central and periperal content from television. It should be noted that the cognitive structures outlined by Piaget develop gradually within the given stages. The ages presented here that correspond to the developmental stages are not absolute but rather general approximations.

Concrete Operations

When children internalize their actions in the form of ideas they have reached the stage of concrete operations. An action in imagination replaces the action the child actually performs. This action in imagination is called an operation. These operations are limited to include actions that deal with

objects on which the child has performed these operations. These operations are therefore called concrete because they relate directly to objects and not to abstract or hypothetical objects and actions (Piaget & Inhelder, 1969).

Formal Operations

The stage of formal operations is attained when the child's operations are no longer restricted to actual objects but encompass abstract ideas. No longer is the child tied to the here and now. Hypothetical, reflective thought characterizes the formal operations stage.

Centration

The principal cognitive mechanism that can account for differences between concrete operational thought and formal operational thought is centration. This mechanism is an integral part of each stage of development. "In the most general sense, development reveals a process of decentralization. The infant begins life in an undifferentiated state. He does not separate self from environment or wish from reality. He is centered about the self (Ginsburg & Opper, 1969, p.68)." Piaget contends that an infant's behavior is centered on the child's own body and actions (Piaget & Inhelder, 1969). The newborn must realize that the world does not center around himself and must learn to adapt his behavior to other people, objects, and actions. For the infant an object ceases to exist once it passes outside the child's perceptual view. As the child develops, decentering from the the self occurs. The child comes to realize that objects exist in and of themselves. They do not necessarily depend on the child's will to exist (Ginsburg & Opper, 1969). Once behavior has been decentered, the child must begin to decenter thought.

The decentering of thought begins in the concrete operations stage and culminates in the final fundamental decentering, which occurs at the end of childhood in the formal operations stage (Piaget & Inhelder, 1969).

The decentering of thought enables the child to perform a number of cognitive operations. Many of these operations have been outlined and studied by Piaget in a formal logico-mathematical model. For example, the concrete operational child is able to perform operations which can arrange objects in a hierarchy of classes. The child is able to think simultaneously in terms of the whole and its parts. The child's thought does not center on just the part or the whole. In a similar way the decentering of thought enables the child to perform other operations. For a thorough review of this material, the interested reader is referred to Ginsburg and Opper's (1969) introduction.

In the concrete operational stage the child can also decenter perception. Instead of focusing on only one dimension of an object, situation or problem, the child can simultaneously perceive two or more dimensions.

This decentering of perception and thought is not complete, however, until children reach the level of formal operations. Cognitive development at the level of concrete operations still shows major limitations. Here children have difficulty with verbal problems. They are not able to go beyond the concrete data available to them. They can not imagine new possibilities or solutions to problems. They fail to see a situation from another's viewpoint and are limited to a trial and error problem solving strategy rather than a hypothesis

testing strategy. They can not see general rules that apply across problems and situations, but are restricted to a particular problem and situation. They are often times unable to see the premise in a logical argument and can not accept hypothetical assumptions. In short, their thinking is still not completely decentered. At the formal operational stage, however, these limitations in cognitive capabilities are overcome (Piaget & Inhelder, 1969; Ginsburg & Opper, 1969; Beard, 1969; Evans, 1973).

The decentering of perception, attention and thought should have a major impact on what concrete operational and formal operational children learn from television.

Decentering Perception

Cognitive developmental theorists have proposed that the range of perceptual activity increases to a point. Vurpillot (1968) tested the hypothesis that improvement in task-irrelevant learning may be derived from developmental changes in the range of children's perceptual activities. He recorded the eye movements of six and nine-year-olds prior to their making similarity judgments between objects. Younger children scanned only limited areas of the stimuli, while older children scanned broadly before making a judgment. Ranges in perceptual activity employed by children seem bound by developmental changes. These changes revolve around the child's ability to decenter perception. In so doing they focus on more than one or a few aspects of a stimulus and are able to learn more material.

This increase in learning may also be due in part to an increased memory capacity. Wackman and Wartella (1977) in reviewing cognitive development theory cite recent research in children's information processing that indicates differences in youngsters' short-term memory capacities (Farnham-Diggory, 1972). Children as young as five seem to remember only about four pieces of information. Adult short-term memory capacities are probably limited to about seven pieces of information. These differences in short-term memory may explain differential recall, since information is first stored in short-term memory and then transferred to long-term memory. To explain why peripheral learning decreases when children reach the stage of formal operations, one must consider a number of additional cognitive processes, the first of which concerns attention.

Decentering Attention

As children grow older they acquire the ability to selectively direct their attention. With increasing age, the child is able to direct attention to the relevant aspects of a task and away from the irrelevant aspects. They show improvement in their ability to simultaneously direct attention at the potentially large number of relevant dimensions of their task. They do not center their attention on only a few of these dimensions (Druker & Hagen, 1969). The present explanation for the decrease in peripheral learning is still incomplete. In order to explain how this learning occurs, it is necessary to consider children's ability to follow the plot of a program. This entails learning information that is implied by the relations between scenes and discerning the causal sequence of events.

Decentering Thought

Collins and Westby (1975) asked second-and eighth-grade boys and girls questions about information that was not presented in any one scene of a television program they had just seen, but was inferred by adult judges from the relationship between scenes. Results indicated that eighth graders remembered more of the implied information than second graders. It wasn't the second graders inability to remember the information from which inferences could be drawn correctly that led to lower implied learning scores, but rather their inability to link the information together. A more recent study employing a wider range of grades found similar results. Second graders learned 47 percent of the implied information, fifth graders learned 67 percent while eighth graders learned 77 percent (Collins, Wellman, Keniston, & Westby, 1978). As children move from concrete operational to formal operational stages of cognitive development, they are better able to recall information that is implied by the relationship between scenes. This ability is dependent upon the child's capacity to decenter thought and go beyond the concrete data available. They must be able to perform combinational thinking. That is, they must take information presented in two or more scenes of a program and combine it into new information. This combinational thinking is characteristic of formal operational thought (Piaget & Inhelder, 1969).

In addition to learning implied information, the child's ability to follow the causal sequence of events in a program is important in following the plot. After children had viewed an edited version of an action adventure program, Collins, Berndt and Hess(1974) asked them to recall the actions of the principal characters. They were questioned further about the motives for, and the consequences of, these actions. In recalling these causal sequences, younger children tended to remember only the actions and/or their consequences while older children relied more on the full complement of motives, consequences and actions. None of the kindergarteners and only about 7 percent of the second graders recalled motives, but they each (93 percent of the kindergarteners and 93 percent of the second graders) remembered the actions and/or consequences. On the other hand, most (80 percent) of the eighth graders recalled motives while only 20 percent of the eighth graders remembered only the actions and/or consequences. For the fifth graders the findings were about in the middle. About 46 percent of the fifth graders recalled motives while 53 percent of them remembered only actions and/or consequences. These findings are indicative of the final decentering of thought for the formal operational child. The heavy reliance of these children on the TV characters' motives exemplifies the formal operational child's ability to look at a situation from another's viewpoint. This ability usually is found in formal operational children (Piaget & Inhelder, 1969).

Briefly then, as children move from the stage of concrete operations to formal operations: (a) there is an increase in their range of perceptual activity and an accompanied increase in memory capacity; (b) their ability to selectively attend to relevant aspects of a task increases; an (c) they are better able to follow the plot of a television program. This reasonsing suggests that peripheral learning should increase with age only to a point as children take in a wider range of stimuli. Once they selectively attend to the relevant aspects of a stimulus, the amount of peripheral material should decrease. When the task is to comprehend the plot of a television program,

children at the formal operational stage (11-12 years old) should show a decrease in peripheral learning.

Peripheral Learning

Recently, Collins (1970) found that peripheral learning from a television situation comedy film increased from third-graders to seventh-graders while it decreased from seventh-graders to ninth-graders. Children from grades three, six, seven, and nine participated in the study. After viewing the film they were asked questions about plot-relevant (central) and plot-irrelevant (peripheral) information. In attempting to replicate this finding, Hawkins (1973) reported inconsistent findings. In employing both an adult and children's film with third, fifth, seventh, and ninth graders, Hawkins found that peripheral learning increased between grades seven and nine for the children's film and decreased, although not significantly, for the adult film. These results are not consistent with the developmental theory outlined above. Replicating a decrease in peripheral learning when children attain the level of formal operations would strengthen confidence in earlier research and lend support to the developmental theory of children's learning from television. This could prove important as a basis for explaining how children learn a variety of content from television. The first hypothesis in this study is derived from this theory and is a replication of earlier findings:

H_1: Peripheral learning increases with cognitive development until children move from concrete operations to formal operations, and then decreases.

Central Learning

The rationale for peripheral learning that was discussed above is also pertinent to an understanding of how children learn central material. As a child's range of perceptual activity increases, more material is perceived. With an accompanied increase in memory capacity, more material is remembered. When the ability to selectively direct attention occurs and children demonstrate they are better able to follow the plot of a TV program, less peripheral material is learned while more central information is retained. Thus, the factors that enable children to learn more peripheral information also enables children to learn more central material as they move from the concrete operational to the formal operational stages. The cognitive developmental processes operating during these stages are assumed to be gradual. Therefore, an increase in central learning would be expected to occur gradually, as children mature. Intuitively, it does not seem that this increase in learning continues in a similar fashion throughout adulthood. At the operational level, it does not appear that the plots of many television programs contain enough central material to test the upper limits of an increase in central learning. Limits in the amount of central material learned have been reported in the literature to occur at the beginning of the formal operational stage (Collins, 1970; Hawkins, 1973).

When significance tests are calculated on the differences in central learning among grades in Collin's (1970) study, a plateau in learning occurs at the sixth grade. This may represent a ceiling effect of the test that was used. Another possibility is that the children learned and the experimenters adequately tested for all of the central material found in the television pro-

gram. For the children to be able to learn all of the central material that actually was present in a program, one must assume that the researcher can measure it. Such an assumption is not realistic since perfect measurement is far from a reality in the social sciences.

The plateau in learning occurred in the Hawkins (1973) study at the seventh grade for the adult film, while central learning continued to increase for the children's film. In an attempt to make the children's learning scores comparable for the two films, the number of correctly answered items was converted to a proportion of the number of items correctly answered by a group of adults. Procedures for creating central and peripheral test questions were identical for the two films of this study and were similar to those employed by Collins (1970). Questions were presented to adult judges who classified them as central (essential to the plot of the program) or peripheral (not essential to the plot of the program). Items that were not agreed upon were eliminated. Whether these findings are an artifact of the amount of central material tested in a given study or more indicative of developmental learning processes remains to be seen. Despite these problems, it is important to test whether central learning increases with development as the present explanation predicts. To the extent that it does increase, the developmental theory of children's learning from televission would be supported. The second hypothesis in this study is a replication of earlier findings:

H_2: Formal operational children learn more central material than concrete operational children.

Possible Confounds to the Developmental Explanation

Past theory and research has suggested three possibly confounding variables which may influence why peripherial learning declines at the age of 11 or 12. These include interest, sex and perceived reality. For example, if children older than 11 or 12 are not interested in a television program or do not believe it is realistic, they may learn less peripheral material than younger children who are interested in a television program and do believe it is realistic. This alternative explanation is certainly not a developmental one and obviously competes with the one outlined in the present study. However, this alternative explanation is supported by either weak or inconsistent evidence.

Interest. A secondary finding from Collins' (1970) research was that those who evaluated the film positively learned more peripheral content within each age group. Hawkins (1973) interpreted this finding to mean that high interest in a film may prevent a decrease in peripheral learning to occur among the 11- to 12-year-old children. He reasoned that they could be so interested in a film that they would learn all they could, including plot- irrelevant material.

In Hawkins' (1973) study he used two films--a children's film and an adult film. He hypothesized that younger children would be less interested in the adult film and that this would affect learning. He found minimum support for the notion that higher interest is positively related to peripheral learning across age; however, the children's film, which was perceived as less interesting by ninth graders, resulted in more peripheral learning than did the more interesting adult film.

Sex. This problem becomes more complex because of an additional finding of sex differences. Hale, Miller, and Stevenson (1968) argued that the type of material presented to children influenced learning. In their study, they reported that girls learned significantly more than boys. They explained that these sex differences were likely due to the domestic situation and social interactions depicted in their film. Girls should have found this content more interesting and thus learned more from the presentation. However, from the Hale, Miller, and Stevenson (1968) study, it is not possible to distinguish central learning from peripheral learning. Consequently, it is not possible to determine if interest influenced central learning, peripheral learning, or both. It is also not possible to determine if these effects were due to interest that was related to one's gender or an interest in the material that was independent of gender.

Collins (1970) also reported sex differences. Girls learned more central material than boys at all grade levels except the third. This may indicate that girls were more interested in the film than boys, or it may indicate that girls are better able to attend selectively to central material. The latter possibility seems less likely since such findings have not been reported in non-media learning studies (Stevenson, 1970). One additional sex difference has been reported in the literature. Hawkins (1973) found that sex was not related to peripheral learning, but interacted with age in affecting central learning. Girls learned more than boys in the third, fifth and ninth grade, while boys learned more than girls in the fifth grade.

To support the explanation presented in this study, it must be demonstrated that a decrease in peripheral learning occurs for the 11- to 12-year-olds, despite individual differences in interest. It is possible that these differences in interest are determined by gender, perhaps through some form of socialization, or are indicative of some innate biological differences such as greater ability to selectively attend for girls.

Perceived Reality. The problem is further exacerbated because it is not possible to tell if the girls in the Collins (1970) study were highly interested in the film. The evaluation index he used which was found to be positively related to peripheral learning was not just indicative of interest, as Hawkins (1973) suspected. This index also contained items concerning the subjects' perceptions of how real they thought the film to be. As a result, one cannot determine interest levels independent of perceived reality.

Children's perceived reality of television has been hypothesized to be an important variable in understanding media effects (Greenberg & Reeves, 1976; Hawkins, 1977; Reeves, 1978). The general expectation is that the more real-to-life a media presentation is, the greater its effect will be. In the present context children should "learn more if the content seems real to them (Schramm & Roberts, 1971, p. 73)."

To summarize briefly, past theory and research on the effects of interest, sex and perceived reality is either weak, inconsistent or not clear in how it influences learning. These factors may explain why peripheral learning decreases for children who are 11 or 12 years old. They may also operate not as confounds to the developmental explanation offered here but merely as enhancers or detractors of learning. That is they may not change the relationships between development and learning but simply affect differences in the amount of

learning within a given stage of development. For example, if interest acts as a confound to the developmental explanation, then 11- and 12-year-olds should learn more peripheral information than older children because the former children were more interested in the program than the latter children were. If interest acts as an enhancer of learning, then within a given age group children who are more interested in a program should learn more than children who are less interested. As an enhancer of learning, interest does not rule out the developmental explanation presented here.

These possible confounds warrant investigation. Consequently, the present study will hold any effects of these variables constant while assessing learning. Should the first two hypotheses be supported, it would be necessary to demonstrate that similar results are obtained even when these third variables (interest, sex, and perceived reality) are controlled. Such findings would provide additional support for the developmental process of children's learning from the media.

H_3: Even when interest, sex and perceived reality are controlled, peripheral learning increases with cognitive development until children move from concrete operations to formal operations and then decreases.

H_4: Even when interest, sex and perceived reality are controlled, formal operational children learn more central material than concrete operational children.

Method

Subjects

Subjects were 343 children from the elementary school (fourth grade, N=91; sixth grade, N=77) and the junior high school (seventh grade, N=87; eighth grade, N=88) in Richland Center, Wisconsin. These grades were selected in order to obtain a range of ages from about nine to 14 years. Concrete operational children are usually between seven and 12 years old while the ages of formal operational children range from about 12 to 15. Fourth-grade children were chosen to represent the concrete operational stage (mean age, 9.8). Eighth-grade children were chosen to represent the formal operational stage (mean age, 13.9). Sixth-and seventh-grade children were chosen to represent a transitional group between the concrete operational and formal operational stages (mean age, 11.8 and 12.7 respectively). Previous research demonstrated that this transitional group of 11-to 12-year olds were able to learn the most peripheral material and this sample would enable comparisons with children younger and older than that age. Fifth-grade students were not available to participate in the study and were excluded from the design.

Grade

Grade levels were employed as operationalizations of stages of cognitive development. In child development research, grade is often used in this way. This is generally due to the unavailability of a reliable and easily administered measure which determines stages of cognitive development (Ward, Wackman & Wartella, 1977).

In order to test the hypothesized learning effects in this study, the grade variable was recoded to form three categories. The sixth- and seventh-grade subjects were combined to form one group of children who were in the 11- to 12-year old range. In this way appropriate tests of the hypothesized relationship between cognitive development and learning were carried out.

This procedure was not followed in the tests of the replication hypotheses (H_1 and H_2) because previous research had not specified the age at which peripheral learning decreased. In order to provide comparable results, the replication hypotheses were tested with grade levels intact, while the remaining hypotheses were tested with the 11- to 12-year-olds grouped together. It seems that the more legitimate test of the hypotheses was to group the sixth- and seventh-grade children because the hypotheses contend that either of these two groups represent children in the transitional period between concrete operational and the formal operational stages.

Procedure[1]

Subjects saw a 13-minute edited version of "In Search of a Porpoise" from Mutual of Omaha's Wild Kingdom. The plot of the film concerned the search for a porpoise. The animal was to be captured and sent to an aquatic zoo. The narrator boarded a ship and set out with the captain and three-man crew of the "Geronimo" to find a porpoise. Once a porpoise was located, the captain of the ship used a net lasso to capture the fish. In order to prevent injury to the very large porpoise, the crew had to man a small skiff to bring the fish in. Once captured the porpoise was put in a stretcher and flown by helicopter to the oceanarium.

Whole classes of both boys (N=192) and girls (N=145) participated in the study. The entire population of children at each grade level served as subjects. Students were not tracked or assigned to classes in any systematic fashion by school officials.

At both schools, one class from each grade level participated during each regularly scheduled class period. Each period lasted 45 minutes. All children saw a video-taped program in their own schools. After viewing the program, questionnaires were passed out.

Measures

Five adult judges determined whether each of 49 questions pertained to central or peripheral content of the TV show. These questions were drawn from the content of the TV program. When at least four of the five judges agreed on a question, it was selected for inclusion in the study. Ten central and 20 peripheral items were selected and included in the questionnaire as multiple-choice questions. The central learning score was the summed total of correct central items ($\bar{X}$ = 6.20, SD = 1.03, range = 2 to 7). Three items were dropped from the total number of central questions in order to maximize internal reliability (Coefficient alpha = .47). The peripheral learning score was the summed total of correct peripheral items ($\bar{X}$ = 5.62, SD = 1.93, range = 0 to 11). Nine items were dropped from the total number of peripheral questions in order to maximize internal reliabiltiy (coefficient alpha = .46). These reliability values approach the standards of reliability (.5) that Nunnally (1967) describes for basic research.

Interest and Reality[2]

Three questions comprised an interest index. These questions asked children how interested they were in the TV show, whether they liked the program and whether they wanted to see similar ones.

Two questions asked children how different the people in the program were from the people they knew in real life and how often they thought the things that happened in this show happened in real life.

These interest and reality items were similar to those questions used by Collins (1970). It was expected in the present study that these items would not form one evaluation index but rather would be representative of two independent dimensions (interest and reality).

In order to determine empirically which items varied together, the interest and reality questions were subjected to principal components, varimax rotation, factor analysis. A minimum eigenvalue of 1.0 was required for a factor to be extracted. A two-factor solution accounted for 67 percent of the variance in the rotated matrix. The interest items loaded heavily on one factor. The three interest items and their loadings were: interested in the TV show (.91), liked the TV show (.91), wanted to see similar shows (.79). The other factor contained the two reality items. These items and their loadings were: how often children thought the things that happened on the show happened in real life (.76), how different the people were on the TV show from people the children knew in real life (.71). Based on these data, the interest items were summed to form an interest index. The internal reliability of this index as indicated by coefficient alpha was .83. The reality items were summed to form an index of perceived reality. The reliability of the perceived reality index was .15.

Data Analysis

The major analytic tool employed to test developmental differences in learning was analysis of covariance. The covariates were interest , reality, and sex. The covariance procedures statistically controlled the influence of these factors while grade was examined. Covariate/factor interactions were not controlled; however, a test was performed to insure such effects were not significant (homogeneity of betas, reported below).

Homogeneity of Betas

Before analyses of covariance were conducted, the assumption of homogeneity of regression coefficients was tested (Cohen & Cohen, 1975; Kerlinger & Pedhazun, 1973). The analysis-of-covariance model assumes that the regression of the dependent variable on the covariates is similar for each level of the independent variables. That is, the model assumes that the regression is "the same across the populations from which the groups are drawn (Cohen & Cohen, 1975, p. 344)". This requires that the interaction between covariates and independent variables be tested. If the interaction is significant, the analysis-of-covariance model is inappropriate. When such an interaction is present, the use of analysis of covariance results in some group means being over- or under-adjusted.

An incremental R^2 test was performed to examine the homogeniety of regression coefficients assumption (Cohen & Cohen, 1975; Kerlinger & Pedhazur, 1973). Each dependent variable was regressed on the covariates and independent variables.

A second analysis included the above variables with the additional interactions of each covariate and independent variable. In this way, the increment in variance accounted for by the addition of the interactions among covariates and independent variable could be examined. When this increment is nonsignificant, the analysis of covariance model is appropriate.

The incremental R^2 tests were performed using the following formula (Kerlinger & Pedhazur, 1973):

$$F = \frac{(R_1^2 - R_2^2) / M_1 - M_2}{(1 - R_1^2) / N - M_1 - 1}$$

Where: R_1^2 = variance accounted for when the dependent variable is regressed on the covariates, independent variable and interactions of covariates and independent variable; R_2^2 = variance accounted for when the dependent variable is regressed on the covariates and independent variable; M_1= the numerator degrees of freedom associated with R_1^2; M_2 = the numerator degrees of freedom associated with R_2^2; N = the total number of subjects; and $(M_1 - M_2)$ and $(N - M_1 - 1)$ are the degrees of freedom.

For each of the dependent variables, analyses revealed that the homogeneity of regression coefficients assumption was valid. For central and peripheral learning scores, the F-ratios from the incremental R_2 tests were $F(9,317)<1.00$, $p>.100$ when grade levels were not grouped and $F(6,321)<1.00$, $p>.100$ when sixth and seventh graders were grouped. By examining the increment in the proportion of variance accounted for when using terms for the interactions of covariates and independent variable, only a small (nonsignificant) gain would be possible for central (.01 to .02) and peripheral (.02 and .02) learning. The statistical power associated with these tests was .90 (Cohen & Cohen, 1975).

Planned Comparisons Among Means

Whenever a planned comparison between two or more means was carried out, the mean square error term (and its appropriate degreees of freedom) from the analysis of covariance was employed as the variance estimate in all t-tests (Ferguson, 1971). One-tailed t-tests were employed to test directional predictions of mean differences.

Degrees of Freedom

The degrees of freedom varied slightly among the many statistical tests employed in this research project because of missing data. The total number of subjects employed in the study was 343. For most of the analysis of covariance tests, ten subjects were eliminated for only some of the calculations.

Computer Programs

In performing the analysis of covariance procedures, the SAS (Helewig & Council, 1979) program dummy coded the categorical independent variable. Adjusted means were provided by this program for every cell in the design.

Results

The effects of grade on learning will be examined to investigate how closely this research replicates previous efforts. Table 1 presents the mean learning scores, score ranges and standard deviations. Analysis revealed that there was a significant increase from fourth to seventh graders' learning of peripheral content, $t(176) = 1.81$, $p<.040$, and the decrease approached significance between seventh and eighth graders' learning of peripheral content $t(173) = 1.56$, $p<.059$. No other differences among grades were significant. The power associated with these tests was .92, assuming a medium effect size (Cohen, 1977). Hypotheses 1 received only weak support since the decrease in peripheral learning from sixth and seventh to eighth graders was significant at the .059 level.

Comparisons of the means for central learning, however, revealed that a significant change occurred between fourth- and sixth-grade children, $t(166) = 2.18$, $p<.025$, and fourth- and seventh-grade children, $t(176) = 2.10$, $p<.025$. No other differences among grade levels were significant. The statistical power associated with these test was .92 assuming a medium effect size (Cohen, 1977). These data do not support Hypothesis 2. To test Hypothesis 3, an analysis of covariance was conducted on the peripheral learning scores. The main effect of grade was not significant, $F(2,327) = 2.60$, $p>.076$. Since specific mean differences were expected among grade levels, appropriate tests were employed.

The adjusted mean peripheral learning scores were: 5.28 (fourth grade), 5.85 (sixth and seventh grade), and 5.48 (eighth grade). Peripheral learning increased from fourth graders to sixth and seventh graders, $t(327) = 2.29$, $p<.011$ while it decreased from sixth and seventh graders to eighth graders, $t(327) = 1.45$, $p<.074$. While the latter difference was not significant it was in the predicted direction. No other differences were significant. The power associated with these tests was greater than .92, assuming a medium effect size (Cohen, 1977). These results do not support Hypothesis 3.

These data were reanalyzed but this time the four distinct grade levels were examined. The adjusted mean peripheral learning scores were: 5.28 (fourth grade), 5.70 (sixth grade), 5.98 (seventh grade), and 5.48 (eighth grade). Peripheral learning increased from fourth graders to seventh, $t(326) = 2.45$, $p<.007$ while it decreased from seventh graders to eighth graders, $t(326) = 1.72$, $p<.043$. The mean square error term from the analysis of covariance on peripheral learning (3.55) employing four levels of grade was used as the variance estimate in these tests. No other differences were significant. The power associated with these tests was greater than .92 assuming a medium effect size (Cohen, 1977). These data indicate that significant decreases in peripheral learning occurred only between seventh- and eighth-grade children when the

significant effects of interest, sex and perceived reality were controlled. This finding supports Hypothesis 3.

In order to test Hypothesis 4, an analysis of covariance was conducted on the central learning scores. When the effects of interest, sex, and perceived reality were held constant, there was a significant effect of grade on central learning, $F(2,327) = 4.10$, $p<.018$. Tests for statistically significant differences revealed that older children (sixth and seventh graders) learned more than younger children (fourth graders), $t(327) = 3.04$, $p<.001$. Similarly, eighth graders learned more than fourth graders, $t(327) = 1.78$, $p<.038$. These means are reported in Table 2. No other significant differences occurred. Eighth graders did not learn significantly more than sixth and seventh graders. These data support Hypothesis 4.

When these data were reanalyzed with separate levels of grade instead of the three collapsed groupings, the adjusted mean central learning scores were: 5.9% (fourth grade), 6.35 (sixth grade), 6.30 (seventh grade) and 6.19 (eighth grade). Central learning increased from fourth graders to sixth graders, $t(326) = 2.77$, $p<.003$, seventh graders $t(326) = 2.52$, $p<.006$, and eighth graders, $t(326) = 1.78$, $p<.038$. The mean square error term from the analysis of covariance on central learning (.99) employing four levels of grade was used as the variance estimate in these tests. No other differences were significant. The power associated with these tests was greater than .92, assuming a medium effect size (Cohen, 1977). These data suggest that central learning increases from the youngest to older children only when interest, sex and perceived reality are controlled.

Covariates

It should be emphasized that interest, sex and perceived reality were significant predictors of each of the learning variables. The models for each of the dependent variables were able to explain a significant amount of the variance in central learning (9%) and peripheral learning (7%).

An effort was made to interpret the relationships between covariates and learning. When the covariates were not analyzed, the tests of Hypotheses 1 and 2 resulted in little if any support of the predicted relationships between learning and grade. When the covariates were controlled, however, evidence supporting these relationships was found. Peripheral learning increased from fourth to seventh graders while it decreased from seventh to eighth graders. Central learning increased from fourth to each of the older groups of children.

When the correlation coefficients between interest and learning were calculated, the relationship between central learning and interst was $r = .11$, $p<.018$, while relationship between peripheral learning and interest was $r = .14$, $p<.006$. The small but significant relationships indicated that the more interested children were, the more they learned.

The correlation between central learning and sex was $-.22$ ($p<.001$)while the relationship between peripheral learning and sex was $-.17$ ($p<.001$). Since

the sex variable was coded 1=boy, 2=girl, these relationships indicate that boys learned more central and peripheral material than did girls.

A comparison among means also resulted in the same findings. For central learning, boys ($\bar{X}$=6.38, SD=.97, N=192) learned significantly more than girls ($\bar{X}$=5.93, SD=1.05, N=145), $F(1,335)=16.40$, $p<.001$. For peripheral learning, boys ($\bar{X}$=5.89, SD=2.03) learned significantly more than girls ($\bar{X}$=5.23, SD=1.74), $F(1,335)=9.94$, $p<.002$.

Comparisons were not made between the covariates and learning variables within grade levels because the previously presented results indicated that these relationships did not change, i.e., test of the homogeneity of betas.

In short, the more interested children were, the more they learned. Boys learned more than girls. Boys were also more interested in the program than the girls ($r = -.15$, $p<.004$).

When the relationships between perceived reality and learning were examined, it was found that children's perceptions of the perceived reality of the program were not significantly related to peripheral learning, $r = -.07$ ($p<.100$), while their perceptions of the perceived reality of the program were significantly related to central learning, $r = .11$ ($p<.043$).

Summary and Discussion

The purpose of this paper was to develop and test a theory of children's learning from television. Two kinds of learning were identified from past studies. These included central learning (plot-relevant information) and peripheral learning (plot-irrelevant information).

The theory predicted that as children move from the stage of concrete operations to formal operations: (a) there is an increase in their range of perceptual activity and an accompanied increase in memory capacity; (b) their ability to selectively attend to relevant aspects of a task increases; and (c) they are better able to follow the plot of a television program. This reasoning led to the prediction that peripheral learning would increase with cognitive development until children moved from concrete operations to formal operations and then decrease.

It was also expected that for the same reasons cited above, central learning would be greater for formal operational children than for concrete operational children.

It was argued that past theory and research on the effects of interest, sex and perceived reality were either weak, inconsistent or not clear in how they would influence learning. It was expected that these variables would not constitute an alternative explanation for the developmental process of children's learning from the media.

Peripheral Learning

Previous research found that peripheral learning from the media increased until children were in the sixth or seventh grade and then decreased. Hale et al. (1968) reported that learning decreased from sixth- to seventh-grade children. Collins (1970) showed a decrease in peripheral learning to begin in the seventh grade. Hawkins (1973) reported a slight (not significant) decrease in learning for an adult film from seventh- to ninth-grade children. In the present study, peripheral learning decreased from seventh- to eighth-grade children ($p<.059$). When interest in the TV show, the sex of the subject, and their perceptions of reality were controlled, peripheral learning decreased significantly from seventh- to eighth-grade children. However, when the sixth- and seventh-grade children were treated as one group, this effect was no longer observed. These results merit three considerations.

First, the developmental theory was supported to the extent that these seventh graders were just entering the stage of formal operations and had not yet acquired all the skills characteristic of this stage of development, while the sixth graders were still in the concrete operational stage. Since these stages of development are conceptualized as being quantitatively different, that is, movement from one stage to the next occurs gradually over time, then this result can still be explained by developmental theory. However, this finding exemplifies the problems inherent in measuring stages of development. By employing grade as an indirect indicator of cognitive stage, one looks for qualitative differences. That is, one grade represents concrete operations (sixth grade), while a different grade represents formal operations (seventh grade). Since the theory describes development as a gradual process, measurement should examine quantitative differences. By developing direct methods of assessing cognitive development, these problems could be avoided.

Second, the significant decrease in learning occurred only when interest, sex and perceived reality were controlled. These factors did not rule out the developmental explanation. They made it more clear. Boys learned more than girls, while the more interested learned more than the less interested. The more realistic the presentation, the more children learned. These factors help to clarify the developmental differences because interest and grade were negatively related. Interest was positively related to learning. The relationship between sex and learning is not easily interpreted. One might expect the relationship between sex and learning to change with the content being studied. This relationship could exemplify biological sex differences or more social and/or situational differences. It seems that in this study, the latter explanation is more valid. The television program concerned the capture of a fish. This topic is probably more interesting and relevant for boys than it is for girls. Boys were probably more familiar with the topic, having had more experience fishing.

Children's perceptions of perceived reality were not consistently related to learning. This was likely due to poor measurement and inadequate conceptualization of the concept. In this study, two questions were employed which were similar to those used in past research (Collins, 1970). This was done to replicate and clarify past research on children's positive evaluations of the television program. Future research should follow the more rigorous con-

ceptualizations and operationalizations of perceived reality available in the literature (cf. Hawkins, 1977) before its relationship to learning will be understood.

The third point of discussion centers around the size of the observed effects. Hays (1973) describes methods for determining the size of an effect. By calculating w^2 one gets an estimate of the variance accounted for by a given independent variable. This estimate of variance accounted for is more conservative than R^2 and is employed in this discussion in order to make comparisons between this study and previous ones. Prior research did not report R^2 nor did the studies provide enough information to calculate R^2 (i.e., sums of squares). Consequently, w^2 was calculated for the findings of this study and previous investigations whenever enough information was provided by the authors. The following formula was used for this purpose:

$$w^2 = \frac{t^2 - 1}{t^2 + N_2 - 1}$$

where t = student t value calculated for the difference between means and N_1 and N_2 are the size of the two groups being compared.

In Collins' (1970) study, grade levels explained two percent of the variance in peripheral learning differences between seventh and eighth graders. The non-significant decrease from seventh- to ninth-grade children's peripheral learning in Hawkins' (1973) study accounted for less than one percent of the variance. In the present study 1.7% of the variance was explained in learning by the decrease from seventh- to eighth-grade children. These are very small effects. While the evidence supports the developmental theory, one has to question the utility of a theory that explains so little.

Examining the magnitude of these effects raises a number of questions. Primarily, does the size of these effects warrant our consideration and further investigation? If it does, how can one better examine peripheral learning from the media?

In answering these questions, researchers must make a very subjective judgment. What is a large-enough effect? For some, accounting for less than ten percent of the variance may not be adequate. On the other hand, accounting for very small amounts of variance in socially important variables (i.e., aggression or prejudice) may be considered to be very meaningful. But the evidence on peripheral learning from the media does not deal with socially important variables. Instead, researchers have been concerned with the learning of relatively trivial information (i.e., the color of a character's shirt). Given the small effects from media studies concerning peripheral learning, perhaps the greatest potential for the developmental theory of peripheral learning lies with the study of social behavior.

Future research could investigate children's learning of social behavior from television as peripheral learning. A series of studies would be required. First, videotaped segments featuring two models who exhibit various forms and degrees of social behavior would need to be created. Perhaps the two char-

acters could be performing a task, e.g., playing a game, that subjects would later play. The behaviors of the models could be varied so that in the course of playing the game, they behave aggressively toward one another. A control condition in which behavior is not aggressive could also be employed. Care would have to be taken to insure that the social behavior of the models was not important or related to the game they were playing. Pro-social, stereotyped and other forms of social behavior could be examined in later studies. Children would watch the program in order to find out how to play the game. Imitated and/or learned behaviors would be assessed. Children could be pretested to ascertain their stage of cognitive development. This type of study could provide evidence concerning the developmental effects of learning social behaviors from a videotaped program. The developmental theory outlined here on peripheral learning could provide predictions about which children would be most likely to learn these behaviors and afford a sense of understanding why these differences should occur.

In order to generalize findings from such studies, to regular television viewing, content analyses would have to be undertaken which would categorize social behaviors as a central part of the plot of programs or as a peripheral part of the plot. It has been speculated in the introduction that many of the negative social behaviors depicted on television may be described as peripheral to the plot. This remains an empirical question.

Research would have to be conducted employing current television programs as experimental stimuli. The impact of popular television characters (cf Reeves & Greenberg, 1977; Reeves & Lometti, 1978) might be assessed and explained by employing the developmental theory presented above.

Central Learning

The developmental theory tested here predicted that formal operational children would learn more central material than concrete operational children. Results indicated that central learning increased from fourth- to sixth- and to seventh-grade children. Since eighth-grade children were thought to represent formal operational children, these findings failed to support the theory. However, once differences between boys and girls, their levels of interest and perceptions of reality were controlled, eighth graders learned more than fourth graders. These results supported the theory. However, examining the amount of variance accounted for provides less encouraging support for the utility of the theory.

In past research, eight percent of the variance in central learning was accounted for by the increase from third to sixth grade (Collins, 1970). In the Hawkins (1973) study, sufficient information was not provided to make a comparison. In the present study 2.2% of the variance was accounted for in the learning of central material between fourth and sixth graders and 1.9% between fourth and seventh graders. When the covariates were employed, 3.9% of the variance was explained in learning between fourth and sixth graders, 3.0% between fourth and seventh graders, and 1.2% between fourth and eighth graders. The size of all of these effects is small.

Past research reported that increases in central learning leveled off when children reached the sixth or seventh grade (Collins, 1970; Hawkins, 1973). This study replicated this finding.

It seems that there are probably at least three reasons why research on central learning generally achieves a plateau in learning. The first one is that central learning is not linearly related to grade. This may be true. The developmental theory predicted a relationship between developmental stage and central learning. Differences among sixth, seventh and eighth graders' central learning may not have been detected because developmentally these children were all quite similar. That is, they were in the same stage of development. Once again, direct measurement of cognitive stages would clarify if this were true.

A second reason for a plateau in central learning concerns the ease with which children of many different ages can follow the plot of a television program and learn the central material. Perhaps by the time children are in the sixth or seventh grade, they are able to learn almost all of the central material presented because the programs' plots are very similar and simple, and because these children have accumulated a great deal of experience watching these programs. The plot of the television program used in this study was certainly a simple one.

The third reason for a plateau in central learning is poor measurement. In the present study an examination of the mean, standard deviation and range of the central learning scores reveals little variability ($\overline{X}$ = 6.20, SD = 1.03, range = 2 to 7). Most of the children answered the central learning questions correctly. Therefore, there was little but small effects among grade levels to be observed. Examining the procedures employed in constructing the test items reveals that care was taken to include a question for all plot-relevant pieces of information. Those questions that the judges most agreed on were selected for inclusion in the study. Perhaps this very procedure fosters the plateau effects. It may be that if judges agree an item of information is central to the plot of a program, then it may also be that this item is easy for children to learn. This would probably be the case in the present study since the plot of the program was not difficult for the children to follow.

It seems that two of these explanations are valid. First, the developmental theory did not predict that learning would continue to increase with grade levels. Second, the plot of the program was not very difficult for children to learn.

Confounds to the Developmental Explanation

The rather small developmental effects (one to eight percent of the variance explained) reported in the media studies may not be necessarily indicative of stages of cognitive development. Rather, these findings may in part be due to children's television viewing experience. It has already been mentioned that central learning stopped increasing when children were in the sixth or seventh grade. This is also the time when peripheral learning has been found to decrease. Perhaps children's real-life television viewing has somthing to do with both findings. As home viewing increases until children are in the sixth or seventh grade, so does central and peripheral learning. Once they

stop viewing as much television (eighth grade), central learning stops increasing, and peripheral learning drops slightly. Thus, the children who are watching the most TV at home are the ones who are learning the most central and peripheral material. Those who watch less at home learn less in the studies. Such an explanation needs to be controlled in future research by measuring time spent viewing television and partialling its effects statistically.

Conclusions

The developmental theory tested here received empirical support. Observed effects in central and peripheral learning were quite small. These findings question the utility of a theory that explained so little. However, before the theory is discared, future research should examine its utility in explaining social behaviors. It is in this way that the theory might hold the most promise.

This study has demonstrated that interest, sex and perceived reality are three variables that are important when considering children's learning from television. They did not, however, act as confounds to the developmental explanation of children's learning.

REFERENCES

Baker, R. K., & Ball, S. J. Mass media and violence. Washington, D.C.: Government Printing Office, 1969.

Ball, S., & Bogatz, G. A. The first year of "Sesame Street": An evaluation. Princeton, New Jersey: Educational Testing Service, 1970.

Ball, S., & Bogatz, G. A. Reading with television: An evaluation of "The Electric Company". Princeton, New Jersey: Educational Testing Service, 1973.

Beard, R. M. An outline of Piaget's developmental psychology for students and teachers. New York: New American Library, Inc., 1969.

Chaffee, S. H., Ward, L. S., & Tipton, L. P. Mass communication and political socialization. Journalism Quarterly, 1970, 47, 647-659, 666.

Cohen, J. Statistical power analysis for the behavioral sciences. New York: Academic Press, 1977.

Cohen, J., & Cohen, P. Applied multiple regression/correlation analysis for the behavioral sciences. Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1975.

Collins, W. A. Learning of media content: A developmental study. Child Development, 1970, 41, 1133-1142.

Collins, W. A., Berndt, T., & Hess, V. Observational learning of motives and consequences for television aggression: A developmental study. Child Development, 1974, 45, 799-802.

Collins, W. A., Wellman, H., Keniston, A., & Westby, S. Age-related aspects of comprehension and inferences from a televised dramatic narrative. Child Development, 1978, 49, 389-399.

Collins, W. A., & Westby, S. Children's processing of social information from televised dramatic programs. Paper presented at the annual meeting of the Society for Research in Child Development, Denver, Colorado, April, 1975.

Druker, J. F., & Hagen, J. W. Developmental trends in the processing of task-relevant and task-irrelevant information. Child Development, 1969, 40, 371-382.

Evans, R. J. Jean Piaget: the man and his ideas. New York: E. P. Dutton & Co., Inc., 1973.

Farnham-Diggory, S. The development of equivalence systems. In S. Farnham-Diggory (Ed.), Information processing in children. New York: Academic Press, 1972.

Ferguson, G. A. Statistical analysis in psychology and education. New York: McGraw-Hill, 1971.

Flavell, J. H. The developmental psychology of Jean Piaget. Princeton, New Jersey: D. Van Nostrand, 1963.

Gerbner, G., Gross, L., Eleey, M. F., Jackson-Beeck, M., Jeffries-Fox, S., & Signorielli, N. TV violence profile no. 8: The highlights. Journal of Communication, 1977, 27(2), 171-180.

Ginsburg, H., & Opper, S. Piaget's theory of intellectual development: an introduction. Englewood Cliffs, New Jersey: Prentice-Hall, 1969.

Greenberg, B. S., & Reeves, B. Children and perceived reality of television. Journal of Social Issues, 1976, 32, 86-97.

Hale, G. A., Miller, L. K., & Stevenson, H. W. Incidental learning of film content: A developmental study. Child Development, 1968, 39, 69-77.

Hawkins, R. P. Learning of peripheral content in films: A developmental study. Child Development, 1973, 44, 214-217.

Hawkins, R. P. The dimensional structure of children's perceptions of television reality. Communication Research, 1977, 4, 299-320.

Hays, W. L. Statistics for the social sciences. New York: Holt, Rinehart, and Winston, 1973.

Lewig, J. T., & Council, K. A. SAS user's guide, 1979 edition. Raleigh, North Carolina: SAS Institute, Inc., 1979.

Kerlinger, F. N., & Pedhazur, E. J. Multiple regression in behavioral research. New York: Holt, Rinehart, and Winston, 1973.

Lometti, G. E. Motivation and children's learning from television. Unpublished doctoral dissertation, University of Wisconsin-Madison, 1979.

Miller, M. M., & Reeves, B. Dramatic TV content and children's sex-role stereotypes. Journal of Broadcasting, 1976, 20, 35-49.

Nunnally, J. C. Psychometric theory. New York: McGraw Hill, 1967.

Piaget, J., & Inhelder, B. The psychology of the child. New York: Basic Books, 1969.

Reeves, B. Perceived TV reality as a predictor of children's social behavior. Journalism Quarterly, 1978, 55, 682-689.

Reeves, B., & Greenberg, B. Children's perceptions of television characters. Human Communication Research, 1977, 3, 113-127.

Reeves, B., & Lometti, G. The dimensional structure of children's perceptions of television characters: A replication. Human Communication Research, 1979, 5, 247-256.

Schramm, W., & Roberts, D. Mass Media, children's learning from. In L. C. Deighton (ED), Encyclopedia of Education, New York: Macmillan, 1971.

Stevenson, H. W. Incidental learning. In H. W. Stevenson (Ed.), Children's learning. New York: Appleton-Century-Crofts, 1972.

Surgeon General's Report. Television and growing up: The impact of televised violence. Washington, D.C.: Government Printing Office, 1972.

Vurpillot, E. The development of scanning strategies and their relation to visual differentiation. Journal of Experimental Child Psychology, 1968, 6, 632-650.

Wackman, D. B., & Wartella, E. A review of cognitive development theory and research and the implication for research on children's responses to television. Communication Research, 1977, 4, 203-224.

Ward, L. S., Wackman, D. B., & Wartella, E. Children learning to buy: The development of consumer information processing skills. Beverly Hills: Sage Publications, 1977.

Table 1

Mean Central and Peripheral Scores

as a Function of Grade Level

Score	Grade Level 4 (N=91)	6 (N=77)	7 (N=87)	8 (N=88)
Central	5.99 [1.13 2-7] *	6.33 [.87 4-7]	6.31 [.91 3-7]	6.19 [1.13 2-7]
Peripheral	5.42 [2.01 1-11]	5.60 [1.94 2-10]	5.95 [1.94 1-11]	5.51 [1.82 0-9]

* Numbers within each set of brackets are the standard deviations and ranges respectively.

Table 2

Adjusted Mean Central Learning Scores

by Grade

	Grade 4	6 & 7	8
Adjusted $\bar{X}$	5.92	6.35	6.30
$\bar{X}$	5.97	6.32	6.16
N	89	161	83

Note: The mean square error term from the analysis of covariance on central learning (.99) was used as the variance estimate when making a priori planned comparison.

FOOTNOTES

1. The procedures described here are a subset of all the procedures employed with this sample. Only aspects of the design which relate to the hypotheses and tests of this paper are reported here. For a complete discussion of all procedures and measures used see Lometti (1979).

2. The questions and responses were:

   1. How interesting do you think this show was?
      very interesting (3) a little interesting (2)
      not interesting at all (1)

   2. How much did you like the TV show?
      a lot (4) a little (3) not very much (2) not at all (1)

   3. How often wld you like to watch other TV shows like this one?
      all the time (3) sometimes (2) almost never (1)

   4. How different were the people in this TV show from the people you know in real life?
      very different (1) a little different (2) not very different (3)
      not different at all (4)

   5. How often do you think the things that happened on this TV show happen in real life?
      all the time (3) sometimes (2) almost never (1)